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Crucial factors over the of Life cycle Value for Combined Cycle Power Plants

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Abstract :

The financing schedule for the life time of a combined cycle power plant is essential. It has to be Considered during the EPC phase, the O&M period, etc. However the cash flow will be affected by several factors during EPC (e.g. optimized planning time will reduce the construction & commissioning time & costs) and O&M (e.g. fuel, service & replacement parts) phase as well as book life of equipment, domestic taxes, tax and equipment depreciation, interest rates and discount rates etc. In respect to the operation of a high efficiency and complex combined cycle power plant, the costs for unscheduled maintenance are crucial. These unexpected downtimes could lead to lost of revenues and/or penalties according to the Power Purchase Agreement (PPA). Therefore a continuously remote operating diagnostic system, which needs to be supported by the OEM engineering organization, for preventive maintenance is one of the essential keystones for the optimization of operational costs for replacement parts and to avoid any unscheduled standstill of the complete combined cycle power plant. In addition the availability of necessary replacement parts for routine and preventive maintenance has to be optimized at site. Other key elements are the longer operation intervals, resulting in a higher availability as well as the optimization of the scheduled maintenance period for each single component which will definitely reduce the outage time.Implementation of the optimized maintenance concept via long term programs, the day-to-day operation will significantly reduce the operating risk of the combined cycle power plant as well as decreasing potential downtimes due to unscheduled and/or additional maintenance activities. Long Term Programs are managed programs for parts, parts repairs, program management and services for gas turbines, steam turbines, and generators and offering enhanced warranties to reduce further remaining risks.

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Introduction

mere 200 years ago only three percent of the world's population lived in urban areas. Today more than half of the world's people – over 3.5 billion – live in cities. Around 50 percent of global economic output is now generated by the world's 600 largest metropolitan areas. Likewise, cities account for around two thirds of worldwide energy consumption and up to 70 percent of greenhouse gas emissions, despite covering a mere two percent of the earth's surface.
That's why we must first look at our cities as we begin to look for solutions to the most pressing problems of our time, including, most particularly, climate change and the increasing scarcity of natural resources. Given the high population density of urban areas, there is tremendous potential here for boosting efficiency in areas such as power generation, distribution, and utilization in buildings and transportation systems. In other words, the key to humanity's future will be found exactly where civilization began: in cities.
The good news is that many urban areas are facing up to this responsibility and taking measures to reduce their environmental footprint. Leading the way are Copenhagen and Melbourne. The Danish capital is aiming to completely eliminate its net CO_2 emissions by 2025, and Australia's second-largest city is looking to reach the same target as early as 2020.
Siemens estimates that global demand for electricity will rise by around two thirds between now and 2030. Power plants with a combined generating capacity of around 7,000 gigawatts (GW) are slated for construction over that period. Over one third of these plants will use renewable, carbon-free sources of energy such as wind, hydro, and solar. However, around 45 percent of this generating capacity will still be supplied by power plants burning fossil fuels such as coal and gas. In other words, the next 20 years could well see an increase of

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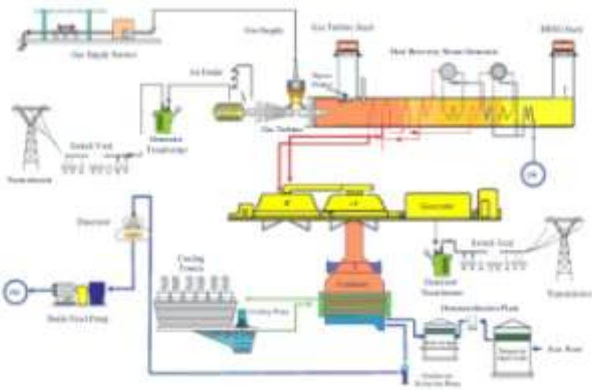
around 50 percent in fossilfuel generation. This primarily applies to Asia and the U.S., as both of them are now turning to highly efficient gas-fired power plants, some of which feature technology from Siemens.

Changes in today's energy markets are presenting power producers worldwide with new challenges and opportunities. In a competitive, market-driven economy, it is more important than ever to reduce power generation cost and to find solutions that provide a rapid return on investment without sacrificing long-term reliability and flexibility. Based on an extensive experience in building power plants, Siemens has developed innovative combined cycle reference power plants, known as Siemens Combined Cycle (SCC™) turnkey plants. These plants help investors to meet the challenges of a dynamic market and are designed to optimize planning, implementation times and lower life cycle costs. It also shortens the planning phase and reduces the construction time. For example, all of our plants are designed with either axial or side-exhaust condensers, which do not require high-elevation foundations. As a result, installation work of main components can start earlier, and the plant can be finished faster. Plants have been completed as quickly as 20 to 24 months. It is an intelligent concept that cuts down construction times and increases customer benefits. The proven design for:

- High efficiency
- Superior reliability and availability
- Controlled capital costs
- Rapid implementation
- Environmental compatibility
- Operational flexibility

How do you design a combined cycle power plant for today's demanding market? The family of advanced combined cycle power plants was developed based on a common design philosophy.

These reference power plants are available in single-shaft or in multi-shaft configurations in the capacity range between 150 MW and over 1000 MW for both 50 Hz and 60 Hz applications. Whether single-shaft or multi-shaft, designing with state-of-the-art 3-D modeling results in rapid, high quality power plant implementation. For example, an increase in electrical efficiency of just one percentage point in an 800 MW facility results in an additional output of 60 million kilowatt-hours per year. That's enough to supply electricity to 30,000 more people at the same fuel cost and the same CO_2 emission level. The fuel issue is particularly important, since fuel costs account for 75 percent of a power plant operator's total costs.



Combined cycle power generation using natural gas is currently the cleanest available source of power using hydrocarbon fuels, and this technology is widely and increasingly used as natural gas can be obtained at increasingly reasonable costs. Locally produced electricity and heat using natural gas powered Combined Heat and Power plant (CHP or Cogeneration plant) is considered energy efficient and a rapid way to cut carbon emissions.

The basis on which natural gas is sold and priced varies dramatically between global markets. As natural gas becomes an increasingly important source of energy, understanding of gas pricing concepts is crucial for energy producers, consumers, and regulators.

Oil is sold by volume or weight, typically barrels or tons. By contrast, natural gas is sold by unit of energy. Common energy units include British Thermal Units (Btu) and Joules (J). Natural gas, when produced from the reservoir, contains majority methane plus various other hydrocarbons and, undesirably, some impurities. Natural gas liquids (NGLs), a term that includes ethane, propane, butane, and condensates, are composed of longer chains of carbon molecules than methane, and thus, per unit volume, they burn hotter than methane. The competitiveness and profitability and thus the ability of a power plant to generate value for its owner are

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influenced by a range of key factors, which can be divided into the areas of capital investment, technical characteristics/performance and operating cost. These factors and their development over time are represented by the positive (earnings) and negative (cost) cash flows evaluated in a LCC analysis. Some of these factors can be precisely determined, some of them are volatile (e.g. gas and electricity prices) and can only be vaguely mapped and especially the prediction of their future performance may be associated with a relatively high degree of uncertainty. This uncertainty also affects the validity and sensitivity of the evaluation metrics at changing economic boundary conditions. An overview of the most important cost and earnings factors is shown below.

Figure 9 Key Factors for Competitiveness

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